Proposed Amended Rule 463 – Organic Liquid Storage

Working Group Meeting #2
Date: March 7, 2024

Join Zoom Meeting:
https://scaqmd.zoom.us/j/94266618893
Meeting ID: 942 6661 8893
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Agenda

- Summary of Working Group Meeting (WGM) #1
- Stakeholder Comments & Responses
- Contingency Measure
- Best Available Retrofit Control Technology (BARCT) Assessment Process
- South Coast AQMD Storage Tank Regulations and Requirements
- Other Agency Regulations and Requirements
- Assessment of Leak Detection and Pollution Control Technology
- Cost-Effectiveness for Leak Detection and Pollution Control Technology

Summary of WGM #1

Staff provided information regarding:

- The background of Proposed Amended Rule 463 (PAR 463)
- PAR 463 applicability
- Key factors of organic liquid storage
- Potential sources of fugitive emissions
- Opportunities for emission reductions from storage tank components

https://www.environmentalworks.com/wp-content/uploads/2015/07/Fuel-storage-tank.jpg

Stakeholder Comments and Responses

Staff's Estimation of Crude Oil RVP

Question #1

- Which API gravity was used to determine staff's estimation of crude oil Reid Vapor Pressure (RVP) to be ~ 8 psia?

Response

- Reported RVPs in 2020 inspection reports ranged from 1.77 psia to 7.87 psia for crude oil however many facilities did not report RVP
- Staff reviewed 2019 inspection reports (more complete data set) for reported RVP values of crude oil and determined the highest reported value to be 8.14 psia
- The exact API is unknown because facilities can use any approved method described in Rule 463 paragraph (h)(3) to determine RVP

Maximum Tank Size Regulated by Rule 463

Comment #1

- The maximum tank size for the PAR 463 affected universe is underestimated

Response

- Staff reviewed the current PAR 463 affected equipment list and identified tanks with a capacity of 21 million gallons
- The tank range will be corrected to account for the larger tanks

Projected Rule Development Schedule

Comment #2

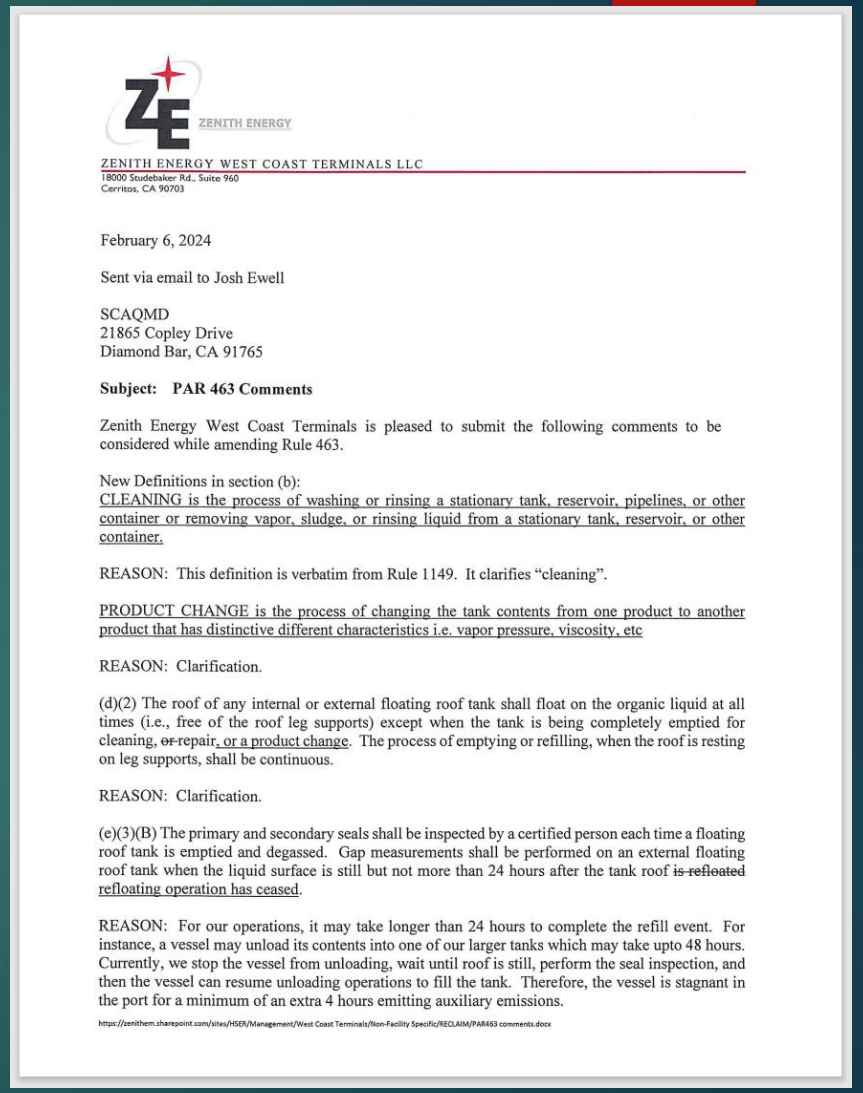
- The pace of the tentative rule schedule is too fast

Response

- Staff acknowledges the concern and will consider adjusting the schedule if the rule development needs more time
- The pace is quicker because of the need to adopt a contingency measure
- Staff is seeking additional stakeholder feedback on the proposed rule schedule

Zenith Energy West Coast Terminals LLC Comment Letter

- South Coast AQMD received a comment letter form Zenith Energy on February 6, 2024
- Comment letter identified seven areas of proposed changes to Rule 463
- Included proposed definition and rule updates for clarification
- Zenith Energy's complete comment letter can be found on the PAR 463 Proposed Rules page*



ZENITH ENERGY

ZENITH ENERGY WEST COAST TERMINALS LLC
18000 Studebaker Rd., Suite 960
Cerritos, CA 90703

February 6, 2024

Sent via email to Josh Ewell

SCAQMD
21865 Copley Drive
Diamond Bar, CA 91765

Subject: PAR 463 Comments

Zenith Energy West Coast Terminals is pleased to submit the following comments to be considered while amending Rule 463.

New Definitions in section (b):
CLEANING is the process of washing or rinsing a stationary tank, reservoir, pipelines, or other container or removing vapor, sludge, or rinsing liquid from a stationary tank, reservoir, or other container.

REASON: This definition is verbatim from Rule 1149. It clarifies "cleaning".

PRODUCT CHANGE is the process of changing the tank contents from one product to another product that has distinctive different characteristics i.e. vapor pressure, viscosity, etc

REASON: Clarification.

(d)(2) The roof of any internal or external floating roof tank shall float on the organic liquid at all times (i.e., free of the roof leg supports) except when the tank is being completely emptied for cleaning, ~~or~~ repair, or a product change. The process of emptying or refilling, when the roof is resting on leg supports, shall be continuous.

REASON: Clarification.

(e)(3)(B) The primary and secondary seals shall be inspected by a certified person each time a floating roof tank is emptied and degassed. Gap measurements shall be performed on an external floating roof tank when the liquid surface is still but not more than 24 hours after the tank roof ~~is refloated~~ refloating operation has ceased.

REASON: For our operations, it may take longer than 24 hours to complete the refill event. For instance, a vessel may unload its contents into one of our larger tanks which may take upto 48 hours. Currently, we stop the vessel from unloading, wait until roof is still, perform the seal inspection, and then the vessel can resume unloading operations to fill the tank. Therefore, the vessel is stagnant in the port for a minimum of an extra 4 hours emitting auxiliary emissions.

https://zenithem.sharepoint.com/sites/HSER/Management/West Coast Terminals/Non-Facility Specific/RECLAIM/PAR463 comments.docx

*https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-463/comment-letters

New Definition for “Cleaning”

Comment #1

- Propose clarifying the term “cleaning” by including a definition from Rule 1149 – Storage Tank and Pipeline Cleaning and Degassing (Rule 1149)
  - “CLEANING is the process of washing or rinsing a stationary tank, reservoir, pipelines, or other container or removing vapor, sludge, or rinsing liquid from a stationary tank, reservoir, or other container.”

Response

- Staff recognizes the benefit of including Rule 1149’s definition of “cleaning” for clarification and consistency across South Coast AQMD rules
- Staff plans to include the Rule 1149 definition of “cleaning” into PAR 463

Proposed Edits to PAR 463 Paragraph (d)(2) and Product Change Definition

Comment #2

- Propose adding new language to include “product change” to paragraph (d)(2) as an approved process in which a floating roof does not need to be floating on the organic liquid stored and a new definition for “product change”
- “PRODUCT CHANGE is the process of changing the tank contents from one product to another product that has distinctive different characteristics i.e vapor pressure, viscosity, etc.”

Response

- Staff recognizes the proposed language as a clarification to the intent of the existing rule language
  - Tanks must be emptied during a product change require floating roofs to rest on their support legs
- Staff plans to include the proposed language to paragraph (d)(2) as well as defining “Product Change”

Proposed Edits to PAR 463 Subparagraph (e)(3)(B)

Comment #3

- Propose adding new rule language to subparagraph (e)(3)(B) to have floating roof tank seals inspected 24 hours after a refloating operation has ended

Response

- The intent of subparagraph (e)(3)(B) is to ensure that floating roof seals are operating correctly in a timely manner after tanks have been refilled
- Staff believes the proposed edit does not subvert the intent of subparagraph (e)(3)(B) by maintaining the 24-hour inspection deadline while including clarification on the refilling process that can reduce excess auxiliary emissions
- Staff plans to include the proposed language to subparagraph (e)(3)(B)

Proposed Edits to PAR 463 Subparagraphs (e)(3)(C) and (f)(1)(C)

Comment #4

- Propose adding new rule language to subparagraph (e)(3)(C) to:
  - Allow electronic notifications of tank emptying/re-floating operations
  - Reduce the notification lead time to two days to be consistent with Rule 1149 notification requirements
- Propose adding new rule language to subparagraph (f)(1)(C) to require that non-compliance reports be submitted electronically

Response

- Staff acknowledges the environmental benefit of allowing electronic reports and providing consistency between South Coast AQMD rules
- Staff plans to include the proposed language with modifications to subparagraphs (e)(3)(C) and (f)(1)(C)
  - Notifications will be required to be submitted electronically

Question on the Validity of U.S. EPA TANKS

Updated SLide 13

Question #1

- *"Is USEPA TANKS still valid since it is not supported by USEPA?"*

Response

- The U.S. EPA TANKS model was developed using a software that is now outdated and is not reliably functional on computers using older operating systems
  - TANKS is still available on the U.S. EPA website, however, U.S. EPA states it is to "be used at your discretion and at your own risk"*
- U.S. EPA recommends the use of formulas found in the AP-42 chapter 7 to estimate VOC emissions associated from storage tanks**
- South Coast AQMD currently uses the formulas in AP-42 chapter 7 for AER and permitting calculations

*TANKS Emissions Estimation Software, Version 4.09D | US EPA

**Chapter 7: Liquid Storage Tanks, AP 42, Fifth Edition, Volume I | Clearinghouse for Emission Inventories and Emissions Factors | Technology Transfer Network | US EPA

Proposed Edits to PAR 463 Subparagraph (f)(2)(A)

Comment #5

- Propose adding new rule language to subparagraph (f)(2)(A) to include AP-42 as an approved emission reporting method

Response

- Annual Emission Reporting (AER) requirements are outlined in Rule 301 – Permitting and Associated Fees (Rule 301)
  - Rule 301 subdivision (e) requires that emissions are reported, but does not specify a methodology
- Facilities currently use methodologies provided by U.S. EPA, California Air Resources Board (CARB), and South Coast AQMD to calculate emissions
  - AP-42 is used for both AER and permitting requirements

Staff Conclusion on Proposal to Include AP-42 in PAR 463 Subparagraph (f)(2)(A)

- Including specific methods in the rule language can result in required amendments if one of the identified methods is no longer supported
  - For example, U.S. EPA TANKS 4.0 is no longer considered valid and must be removed from PAR 463 subparagraph (f)(2)(A)
- As AP-42 is already an acceptable tool to calculate emissions for AER requirements, staff does not intend to include the proposed language to subparagraph (f)(2)(A)
  - Staff can include a discussion in the staff report stating that at this time AP-42 is an acceptable method to calculate emissions for AER requirements

Contingency Measure

Contingency Measure Background

- Both the South Coast Air Basin and Coachella Valley are classified as an "extreme" nonattainment area for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS), with an attainment date of July 20, 2032
  - Being in “extreme” nonattainment for the 8-hour ozone NAAQS requires substantial reductions of ozone precursor emissions (e.g., volatile organic compounds) to meet the standard
- The federal Clean Air Act (CAA) requires that State Implementation Plans (SIPs) must provide for contingency measures defined by CAA section 172(c)(9)
- Contingency measure elements were submitted as part of the 2016 AQMP
  - However, due to recent court actions, the contingency measures in the 2016 AQMP were no longer approvable
  - In 2022, the South Coast AQMD withdrew the contingency measure elements for the 2008 ozone standard in the Coachella Valley to avoid potential disapproval by U.S. EPA
  - U.S. EPA finalized a finding of failure to submit contingency measure elements of the Coachella Valley 2008 ozone NAAQS effective October 31, 2022

SIP Deficiency Repercussions

- The SIP deficiency must be corrected to avoid sanctions defined in federal CAA Section 179(b)
- If contingency measures are not in place:
  - A Coachella Valley stationary permit sanction can be triggered on April 30, 2024, increasing the offset ratio from 1.2:1 to 2:1
  - A Coachella Valley highway sanction can be triggered on October 31, 2024, resulting in the loss of federal highway funding for Coachella Valley
  - U.S. EPA can promulgate a Federal Implementation Plan
- A new contingency measure needs to be developed and submitted to U.S. EPA to avoid sanctions

Coachella Valley 2008 8-Hour Ozone SIP Revision

- The South Coast AQMD Governing Board adopted the Coachella Valley Contingency Measure SIP Revision for the 2008 8-Hour Ozone Standard based on U.S. EPA updated draft guidance on contingency measures*
- Chapter 3 includes South Coast AQMD's contingency measure to amend Rule 463 to require more frequent optical gas imaging (OGI) inspections, if triggered
- PAR 463 will include contingency measures for both the Coachella Valley and the South Coast Air Basin

*https://www.aqmd.gov/home/air-quality/clean-air-plans/other-state-implementation-plan-(sip)-revisions/coachella-valley-contingency-measure-sip-revision

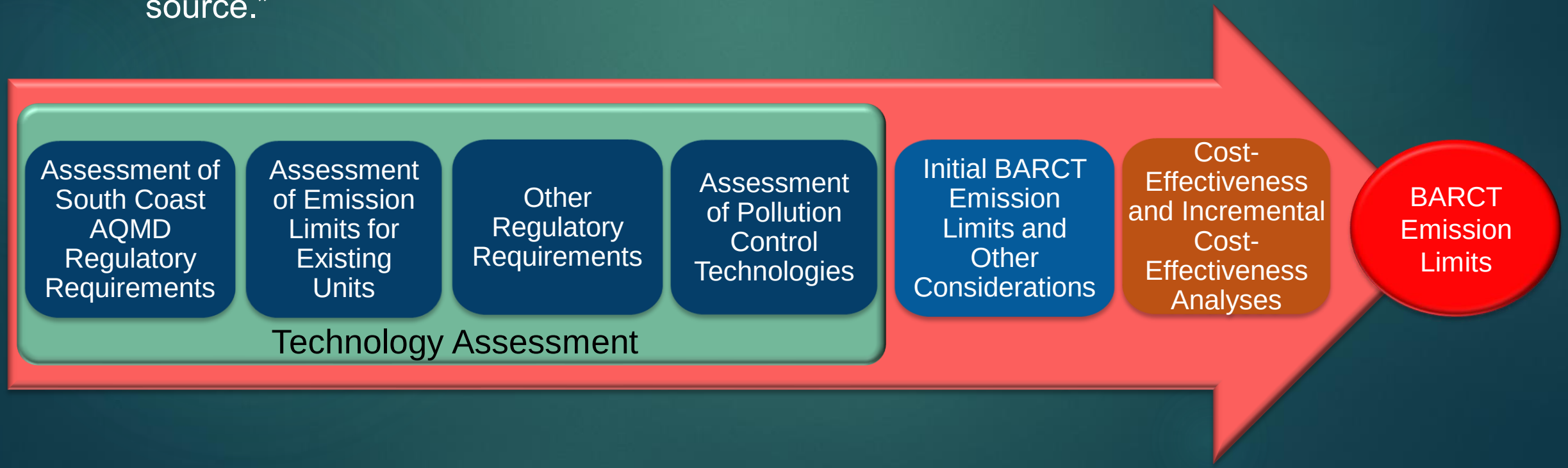
PAR 463 Contingency Measure

- OGI devices produce images of vapors not seen with a naked eye
- Based on 2023 inspection reports, staff determined that approximately 25% of affected facilities had a storage tank leak
  - 1% of tanks experienced a major leak (78,600 ppm)
- Introducing OGI inspections at regular intervals can identify leaks quicker, reducing overall emissions
- Staff will discuss the costs and emission reductions associated with various OGI inspection frequencies in later slides

BARCT Assessment Process

BARCT Assessment

- Staff is conducting a BARCT assessment to determine if alternative control technologies and/or monitoring tools can reduce emissions from above ground organic liquid storage tanks
  - BARCT is defined in the California Health and Safety Code Section 40406 as "…an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source."



South Coast AQMD Storage Tank Regulations and Requirements

South Coast AQMD Requirements for Storage Tanks

Rule 463 – Organic Liquid Storage

Rule 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities

- Staff will compare Rule 463, which generally applies to all tanks, to Rule 1178 which applies to tanks at petroleum facilities emitting more than 20 tons per year of VOC
- The comparison will highlight control requirements that will be evaluated for BARCT

General Control Requirements Overview for Rule 463 and Rule 1178

- Controls include roof types and specific requirements for components on each roof type
- Requirements will be explained in further detail in upcoming slides

Roof type requirements

- External floating roof; or
- Internal floating roof; or
- Fixed roof with vapor recovery system

Roof type component requirements

- External and internal floating roofs
  - Covers on roof openings
  - Rim seal system requirements
- Fixed roof with vapor recovery system
  - Pressure vacuum device
  - Vapor tight roof conditions

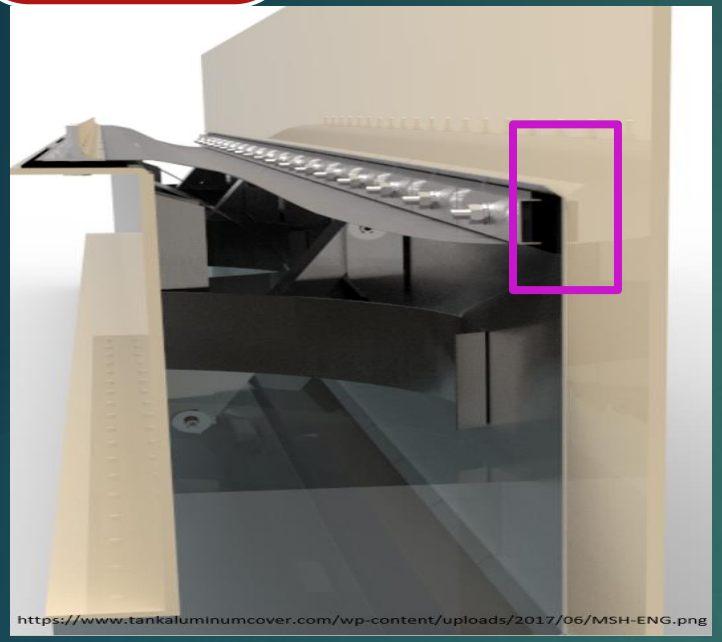
Assessment of South Coast AQMD Regulatory Requirements

Rule 463 Floating Roof Openings Requirements

- External floating roofs:
  - All openings in the roof must be covered (exception for pressure-vacuum valves)
- Internal floating roofs:
  - All openings and tank fittings need to be equipped with either a gasket or by another method approved by the South Coast AQMD

➢ *Examples:*

Rule 463 Floating Roof Gap Requirements

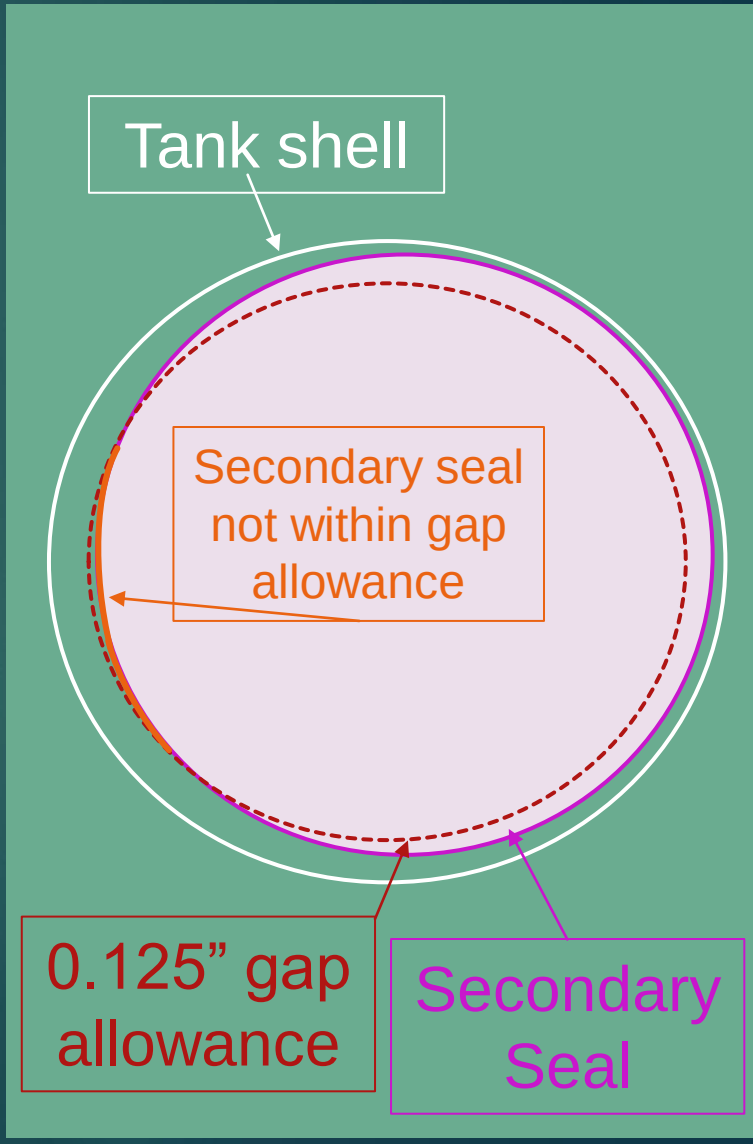


Gaps between primary seal and tank shell

- No gap larger than 1.5”
- Gaps >0.5” not to exceed cumulative length of 30% of circumference
- Gaps >0.125” not to exceed 60% of circumference
- No continuous gap >0.125” can exceed 10% of circumference

Gaps between secondary seal and tank shell

- No gap larger than 0.5”
- Gaps >0.125” not to exceed cumulative length of 95% of circumference



Assessment of South Coast AQMD Regulatory Requirements

Rule 463 Inspection and Monitoring Requirements

Roof Type	Requirements
Fixed roofs	• Voluntary self-inspection
Floating roof tanks	• Complete gap measurements of rim seal system on semiannual basis and each time tank is emptied or degassed • Inspected by a certified person twice per year at 4 to 8 months intervals • Self Inspection and Maintenance Plan

Assessment of South Coast AQMD Regulatory Requirements

Rule 463 Inspection Requirements

Visual Inspections

Applies to: All floating roof tanks

Procedure: Visually inspect rim seal systems and roof openings for visible gaps, holes and tears

Frequency: Twice a year at 4 to 8 month intervals and every time a tank is emptied or degassed

Gap Measurement Inspections

Applies to: All floating roof tanks

Procedure: Use probe to determine if rim seals and roof openings meet gap requirements

Frequency: Twice a year at 4 to 8 month intervals and every time a tank is emptied or degassed

Assessment of South Coast AQMD Regulatory Requirements

Rule 463 Inspection Methods

EPA Method 21

Applies to: Fixed roof tanks attached to vapor recovery system

Procedure: Certified person uses portable device to detect and measure VOC emissions from tank gauging or sampling device, tank roof, all piping, valves, and fittings

Frequency: Dependent on the inspection schedule established in the self-inspection plan

Overview of Rule 1178

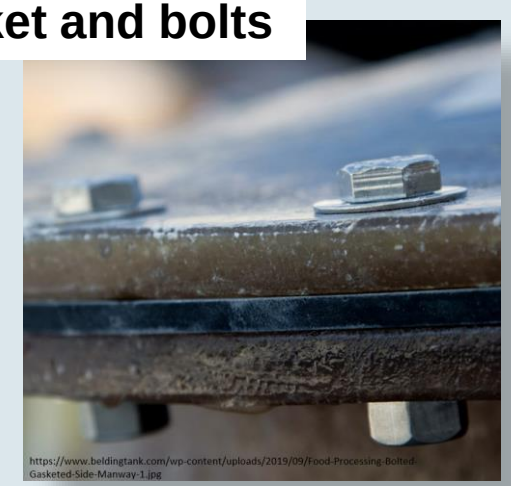
- Rule 1178 was adopted in 2001 to reduce VOC emissions from organic liquid storage tanks located at higher emitting Petroleum Facilities
  - Applies to facilities that emit more than 20 tons VOC per year
- Supplements Rule 463 with:
  - More stringent seal gap requirements
  - Higher control device efficiency
  - More frequent and earlier detection/monitoring

Assessment of South Coast AQMD Regulatory Requirements

Rule 1178 Floating Roof Openings Requirements

- Floating roofs require specific emission control devices on all roof openings
  - Gaskets (rim vents, vacuum breakers)
  - Gasketed covers (guidepoles, sample wells)
  - Sleeves or flexible enclosure systems (roof drains, roof legs, guidepoles)

➢ *Examples:*



- Roof opening gaps cannot exceed “visible gap” allowance of 1/8” (0.125”) or must remain in vapor tight condition (<500 ppm) at all times

Comparison of Seal Gap Requirements Between Rules 463 and 1178

Category	South Coast AQMD Rule 1178	South Coast AQMD Rule 463
Primary seal type	▪ Metallic shoe or liquid mounted	▪ Metallic shoe or liquid mounted
Secondary seal type	▪ Primary and secondary seals required on all floating roof tanks	▪ Primary and secondary seals required on external floating roofs ▪ Liquid mounted primary seal or primary and secondary seals required on internal floating roofs
Primary seal gap	▪ Maximum gap 1.5” (all seals)	▪ Maximum gap 1.5” (all seals)
Secondary seal gap	▪ Maximum gap 0.5”	▪ Maximum gap 0.5”
Gap allowance (primary)	▪ Not more than 10% (gaps > 0.5”) ▪ Not more than 30% (gaps > 0.125”) ▪ No continuous gap more than 10% (gap >0.125”)	▪ Not more than 30% (gaps > 0.5”) ▪ Not more than 60% (gaps > 0.125”) ▪ No continuous gap more than 10% (gap >0.125”)
Gap allowance (secondary)	▪ Not more than 5% (gaps > 0.125”)	▪ Not more than 5% (gaps > 0.125”)

Comparison on Monitoring Requirements Between Rules 463 and 1178

Category	South Coast AQMD Rule 1178	South Coast AQMD Rule 463
Inspections (internal floating roof)	▪ Semi-annual visual and hydrocarbon level inspections ▪ Seal and fitting gap measurements when emptied or degassed, no less than every 10 years ▪ Weekly OGI inspections ▪ Component inspections every six months	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (external floating roof)	▪ Semi-annual tank inspections ▪ Weekly OGI inspections ▪ Component inspections every six months	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (fixed roof)	▪ Quarterly inspections ▪ Weekly OGI inspections	▪ Voluntary inspection program

Other Agency Regulations and Requirements

Other Regulatory Requirements

Storage Tank Requirements at Other Agencies

- Staff compared Rule 463 requirements to storage tank requirements in:
  - San Joaquin Valley APCD: Rule 4623 – Storage of Organic Liquids (SJVAPCD Rule 4623)
  - Bay Area AQMD: Regulation 8, Rule 5 – Storage of Organic Liquids (BAAQMD Regulation 8, Rule 5)
- Staff identified differences in other agencies' rules

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San Joaquin Valley APCD (SJVAPCD) Rule 4623

- SJVAPCD Rule 4623 contains requirements for limiting VOC emissions from storage tanks
  - Applies to tanks 1,100 gallons or greater storing organic liquid
  - VOC control requirements
    - Specifications for tank roof type, external and internal floating roof tanks, deck fittings, roof landings, and vapor recovery systems
  - Inspection, maintenance, degassing and cleaning
  - True vapor pressure testing
  - Test methods

Comparison of SJVAPCD Rule 4623 and Rule 463 Tank Controls

Category	SJVAPCD	South Coast AQMD
Controls for tanks >19,800 - 39,600 gal	▪ Pressure vacuum relief valve, or internal floating roof, or external floating roof, or vapor recovery (liquid TVP 0.5 to <1.5 psi) ▪ Primary and secondary seals on all floating roof tanks	▪ Internal floating roof, or external floating roof, or vapor recovery (liquid TVP >0.5 psia)
Controls for tanks >39,600 gal	▪ Internal floating roof, or external floating roof, or vapor recovery (liquid TVP 0.5 to <11 psia) ▪ Primary and secondary seals on all floating roof tanks	

- SJVAPCD more stringent:
  - Requires two seal system on all floating roof tanks

Comparison of SJVAPCD Rule 4623 and Rule 463 Gap and Leak Definition

- SJVAPCD's rule contains definitions for:
  - Visual gap (gap in roof component seals and covers)
  - Gas leak (VOC concentration threshold measured with gas detection device)

Category	SJVAPCD	South Coast AQMD
Visual gap definition	▪ 0.060"	▪ 0.125" (1/8")
Leak definition	▪ Gas Leak: >10,000 ppm	▪ Gas leak: >500 ppm

- SJVAPCD more stringent:
  - Visual gap definition
- South Coast AQMD more stringent:
  - Leak definition

Comparison of SJVAPCD Rule 4623 and Rule 463 Monitoring Requirements

- SJVAPCD's rule contains inspection requirements dependent on tank type

Category	SJVAPCD	South Coast AQMD
Inspections (internal floating roof)	▪ Annual visual inspections and gap measurements every 5 years	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (external floating roof)	▪ Annual visual inspections and gap measurements	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (fixed roof)	▪ Voluntary inspection program	▪ Voluntary inspection program

- South Coast AQMD more stringent:
  - Internal floating roof inspection requirements (SJVAPCD more stringent for gap measurement frequency if tanks are not emptied or degassed in over 5 years)
  - Floating roof inspections required twice a year

Comparison Seal Gap Requirements for SJVAPCD Rule 4623 and Rule 463

Category	SJVAPCD	South Coast AQMD
Primary seal type	▪ Metallic shoe or liquid mounted	▪ Metallic shoe or liquid mounted
Primary seal gap	▪ Maximum gap 1.5” (welded tanks w/ shoe seal) ▪ Maximum gap 2.5” (riveted tanks w/ shoe seal)	▪ Maximum gap 1.5” (all seals)
Secondary seal gap	▪ Maximum gap 0.5”	▪ Maximum gap 0.5”
Gap allowance (primary)	▪ Not more than 10% (gaps > 0.5”) ▪ Not more than 30% (gaps > 0.125”) ▪ No continuous gap more than 10% (gap > 0.125”)	▪ Not more than 30% (gaps > 0.5”) ▪ Not more than 60% (gaps > 0.125”) ▪ No continuous gap more than 10% (gap >0.125”)
Gap allowance (secondary)	▪ Not more than 5% (gaps > 0.125”)	▪ Not more than 5% (gaps > 0.125”)

Bay Area AQMD (BAAQMD)

- BAAQMD Regulation 8, Rule 5 applies to storage tanks with capacity of 264 gallons and greater
- VOC control requirements include:
  - Specifications for tank roof type, external floating roof and internal floating roof tanks, deck fittings, roof landings, vapor recovery systems
  - Inspection, maintenance, degassing and cleaning
  - True vapor pressure testing
  - Recordkeeping
  - Test methods

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

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Comparison of BAAQMD Regulation 8, Rule 5 and Rule 463 Tank Controls

- BAAQMD requires controls dependent on tank size and liquid true vapor pressure

Category	BAAQMD	South Coast AQMD
Controls for tanks ≥19,800 to <39,626 gal	▪ Submerged fill pipe (liquid TVP >0.5 to 1.5 psia) ▪ Internal or external floating roof (liquid with TVP of 1.5 to 11 psia)	▪ Internal floating roof, or external floating roof, or fixed roof connected to vapor recovery
Controls for tanks >39,600 gal	▪ Internal or external floating roof (liquid with TVP of 0.5 to 11 psia)	

- BAAQMD contains different requirements for controls on larger tanks storing liquids with higher TVP
  - Tanks must be equipped with internal or external floating roof – no option for fixed roof tanks with vapor recovery
  - BAAQMD requires the use of submerged fill pipes

Comparison of BAAQMD Regulation 8, Rule 5 and Rule 463 Gap and Leak Definitions

- BAAQMD's rule contains definitions for:
  - Visual gap (gap in roof component seals)
  - Gas leak (VOC concentration threshold measured with gas detection device)

Category	BAAQMD	South Coast AQMD
Visual gap definition	0.060"	0.125" (1/8")
Leak definition	Gas Leak: >100ppm (>500 ppm for pressure-vacuum devices)	Gas leak: >500 ppm

- BAAQMD more stringent:
  - Visual gap definition
  - Leak definition in some cases (100 ppm limited to floating roof malfunctions, emission control devices, pressurized tanks, and pressure-vacuum devices)

Comparison of BAAQMD Regulation 8, Rule 5 and Rule 463 Monitoring Requirements

- BAAQMD's rule contains inspection requirements dependent on tank type

Category	BAAQMD	South Coast AQMD
Inspections (internal floating roofs)	▪ Semi-annual visual inspections ▪ Seal gap measurements every 10 years ▪ Fitting gap measurements when accessible	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (external floating roofs)	▪ Semi-annual gap measurements	▪ Semi-annual tank inspections ▪ Seal and fitting gap measurements when emptied or degassed
Inspections (fixed roofs)	▪ Pressure-vacuum devices inspected semi-annually	▪ Voluntary self inspection program

- BAAQMD more stringent:
  - Fixed roof inspection requirements
- South Coast AQMD more stringent:
  - Floating roof gap inspection frequency

Comparison of BAAQMD Regulation 8, Rule 5 and Rule 463 Seal Gap Requirements

- BAAQMD's rule contains gap requirements for primary and secondary seals

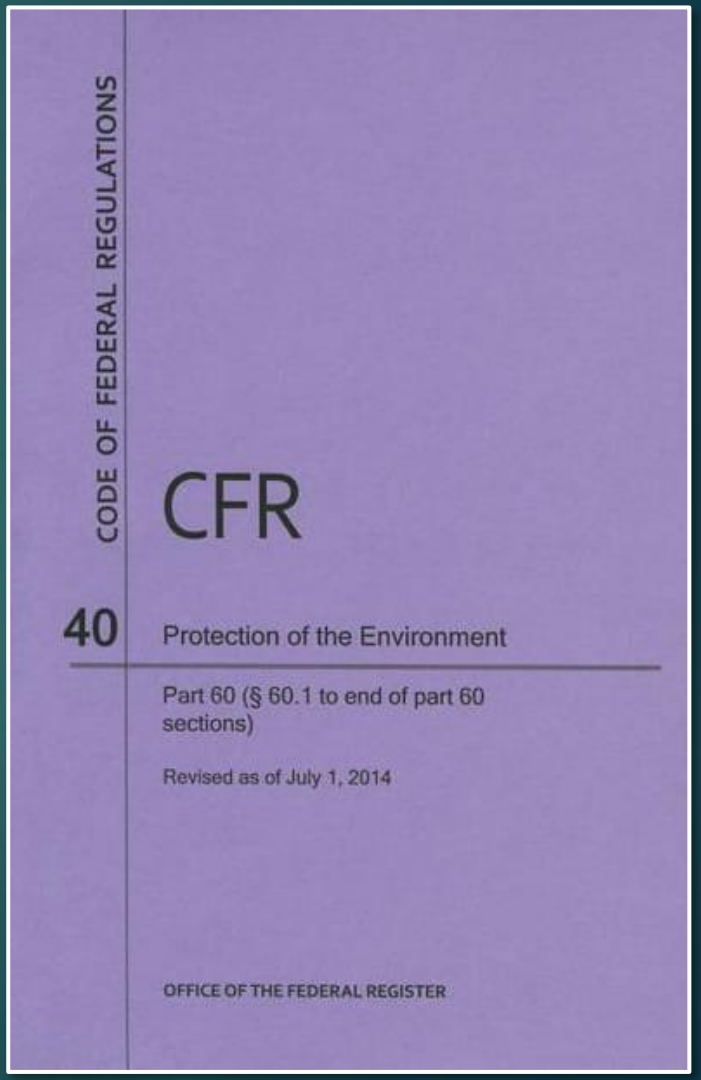
Category	BAAQMD	South Coast AQMD
Primary seal type	▪ Metallic shoe or liquid mounted	▪ Metallic shoe or liquid mounted
Primary seal gap	▪ Maximum gap 1.5" (welded tanks w/ shoe seal) ▪ Maximum gap 2.5" (riveted tanks w/ shoe seal)	▪ Maximum gap 1.5" (all tanks)
Secondary seal gap	▪ Maximum gap 0.5"/0.06"*	▪ Maximum gap 0.5"
Gap allowance (primary)	▪ Not more than 10% (gaps > 0.5") ▪ Not more than 40% (gaps > 0.125") ▪ Not more than 10% (gaps > 1.5") (riveted) ▪ No continuous gap more than 10% (gaps > 0.125")	▪ Not more than 30% (gaps > 0.5") ▪ Not more than 60% (gaps > 0.125") ▪ No continuous gap more than 10% (gaps > 0.125")
Gap allowance (secondary)	▪ Not more than 5% (gaps > 0.125")	▪ Not more than 5% (gaps > 0.125")

- South Coast AQMD more stringent:
  - Primary seal maximum gap requirement for riveted tanks
  - Secondary seal gap requirements for certain tanks*
- BAAQMD more stringent:
  - Primary seal gap allowances

*Applies to welded tanks and external floating roofs installed after 1985 and internal floating roofs installed after 1993

U.S. EPA 40 Code of Federal Regulations (CFR) Part 60 Subpart Kb Seal Gap Requirement

- Staff identified more stringent seal gap requirements in U.S. EPA 40 CFR Part 60 Subpart Kb (does not apply to tanks constructed, reconstructed or modified before July 23, 1984)
  - Primary seal gaps cannot exceed 212 cm^2 per meter of tank diameter
  - Secondary seal gaps cannot exceed 21.2 cm^2 per meter of tank diameter
- Owners and operators are already required to meet U.S. EPA 40 CFR regulations
  - No cost-effectiveness analysis is considered when proposed amendments reflect existing requirements
- Staff will address the discrepancy between Rule 463 and U.S. EPA 40 CFR by adding rule language that incorporates the federal standard by reference



Summary of Other Regulatory Requirements

- Staff identified requirements in SJVAPCD and BAAQMD rules more stringent than requirements at South Coast AQMD
- Areas where Rule 1178, SJVAPCD, and BAAQMD are more stringent than Rule 463:
  - Internal floating roof tank seal requirements (Rule 1178, SJVAPCD)
  - Seal gap allowances (Rule 1178, BAAQMD, SJVAPCD, U.S. EPA)
  - Inspection frequency (Rule 1178, BAAQMD, SJVAPCD)
  - Monitoring Methods (Rule 1178)
  - Leak definition in limited cases (BAAQMD)
- Rule development will focus on:
  - Areas where Rule 463 is less stringent compared to other agency requirements
  - Areas for improvement such as enhanced leak detection and repair requirements

Assessment of Leak Detection and Pollution Control Technology

Assessment of Pollution Control Technologies

Leak Detection Devices

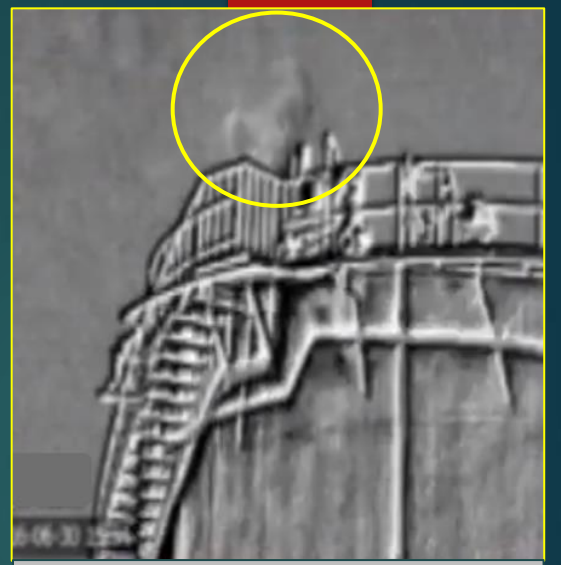
- South Coast AQMD inspectors currently use OGI devices in combination with portable gas analyzers during facility inspections
  - OGI also required in Rule 1178 tank farm monitoring
- Staff is assessing OGI and the following alternative leak detection technologies:
  - Open path detection devices
  - Fixed gas sensors
  - Proximity switches

OGI Devices

Identify Leaks

- OGI devices produce images of vapors not seen with a naked eye
- Leak sizes estimated by vapor cloud image size

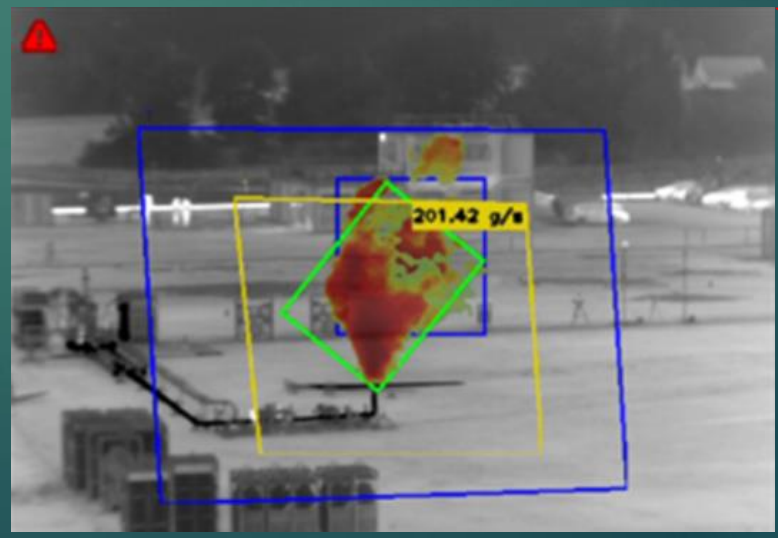
Naked Eye



OGI Camera

Quantifies Leaks

- Some optical gas imaging devices can measure flowrate of a leak
  - Quantification is not yet ready for regulatory purposes



OGI Devices

Platform Variety

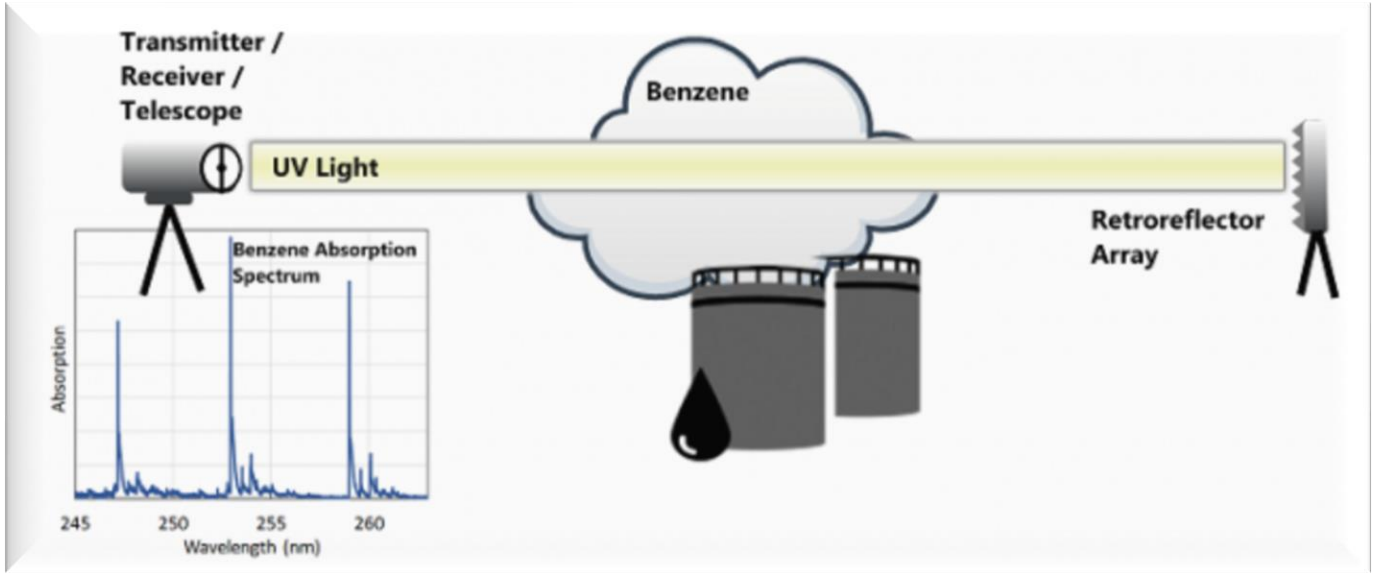
- OGI devices can be used on different platforms to suit monitoring needs
  - Portable handheld
  - Drone
  - Stationary with pan and tilt option

OGI Devices

- Advantages
  - Long range (>100 m)
  - Continuous monitoring option
  - Measures flowrate (some models)
  - Less time consuming (~10,000 components/day)
  - Ability to pinpoint leaks
  - Efficient for large leaks
  - Can identify leaks in inaccessible areas
  - Video records of leaks
- Limitations
  - Inability to confidently measure concentration
  - Weather may affect effectiveness
  - High equipment costs
  - Not all cameras intrinsically safe (require hot work permits)

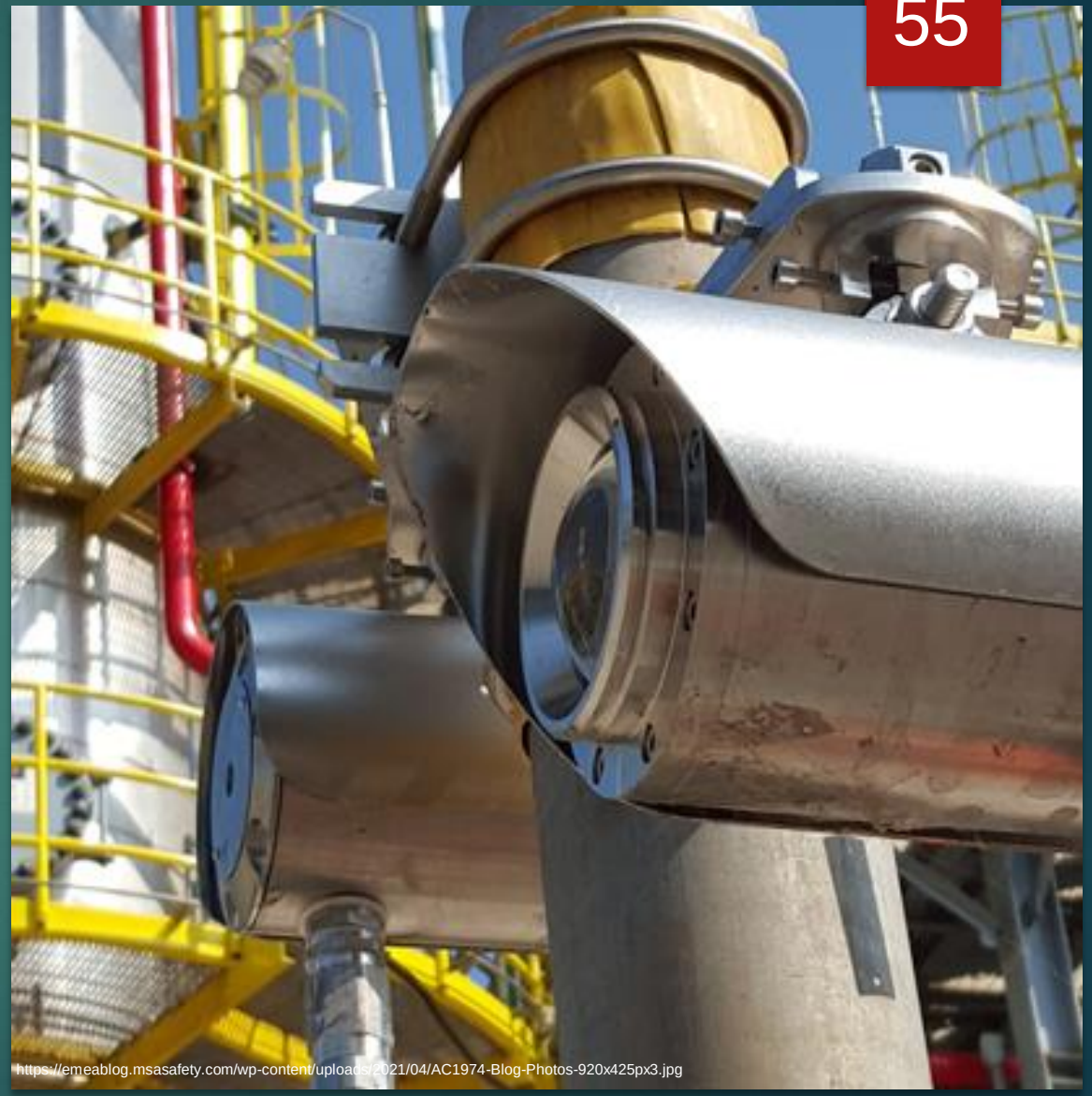
Open Path Laser Detection

- Open path detection devices produce a beam across an area and alert when emissions interfere with beam
- Advantages
  - Detectable limit: ppb level
  - Long range (300m)
  - Continuous monitoring
- Limitations
  - Gas must reach light path
  - Cannot directly identify source of emissions
  - Weather may affect effectiveness
  - High equipment costs



Open Path Effectiveness

- Open path monitoring devices are limited in their ability to detect leaks because they are installed at a distance from the tank
  - Small leaks may go undetected
  - Leaks may need to be significantly large at the source before they are noticed
  - Potential large emissions impact as large leaks can exist for a long period before the sensors capture them
  - Leak detection dependent on the sensor(s) being installed in the right location
    - Sensors upwind are more likely to miss leaks



Stationary Gas Sensors

- Stationary or portable devices that detect gas once in contact with sensor
- Advantages
  - Detectable limit: <1 ppm
  - Continuous monitoring
  - Measures gas concentrations
  - VOC speciation
- Limitations
  - Gas must reach sensor
  - Cannot directly identify source of emissions
  - High operating and maintenance costs

Stationary Gas Sensors Effectiveness

- Faces similar limitations as open path detection technology
  - Leaks may need to be significantly large at the source to be detected
    - Chance that a large leak goes undetected because it does not contact the fixed sensor
  - Potential for a substantial amount of emissions to be released before the sensor detects the leak

https://th.bing.com/th/id/R.000861fd1e8453ab9e2e09d4a39905ed?rik=iFrK8ZpEAKI%2fdA&riu=http%3a%2f%2fresource2.ultdb.net%2fres%2forg0011%2fY2018%2fM05%2f20180509I04G.jpg&ehk=uEZXKJujI2NZXrjSM2tBdAbsxKgfOtOcjsUs1qSiq6Q%3d&risl=&pid=ImgRaw&r=0

Proximity Switches

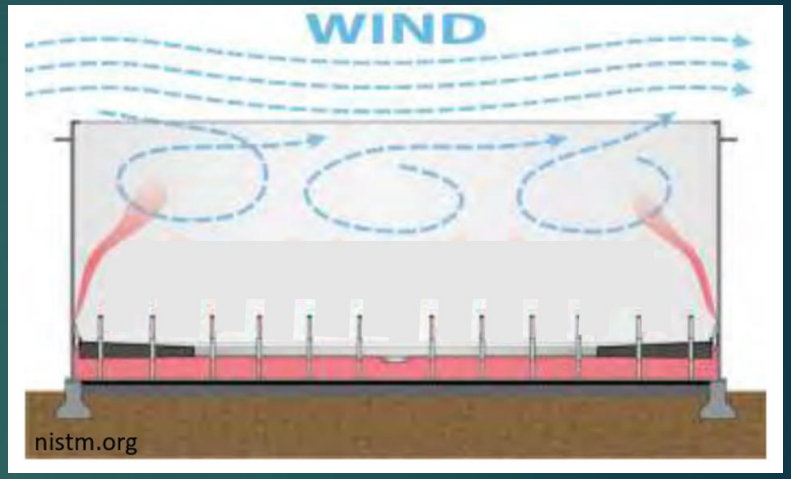
- Proximity switches reduce emissions from roof components not properly closed
  - Sample hatch covers left open or not closed properly
  - Pressure and vacuum relief valve (PVRV) devices opening and not re-seated properly
- Alerts facility when switch detects open covers or vents
- Usually used in remote areas without regular monitoring
  - Remote oil and gas production facilities
- Proximity switches are limited in their ability to detect small openings of the sample hatch cover or PVRV seat (covers and/or PVRV seats open 10%-15% of their range may go undetected)

Proximity Switch Effectiveness

- Advantages
  - Instant alert of detected leaks
  - Continuous monitoring
- Limitations
  - Only monitors two potential sources of leaks
  - Can potentially miss small openings allowing for leak to go unnoticed
  - Spread out design of tank farms requires the use of multiple transmitters to support each switch leading to high equipment costs

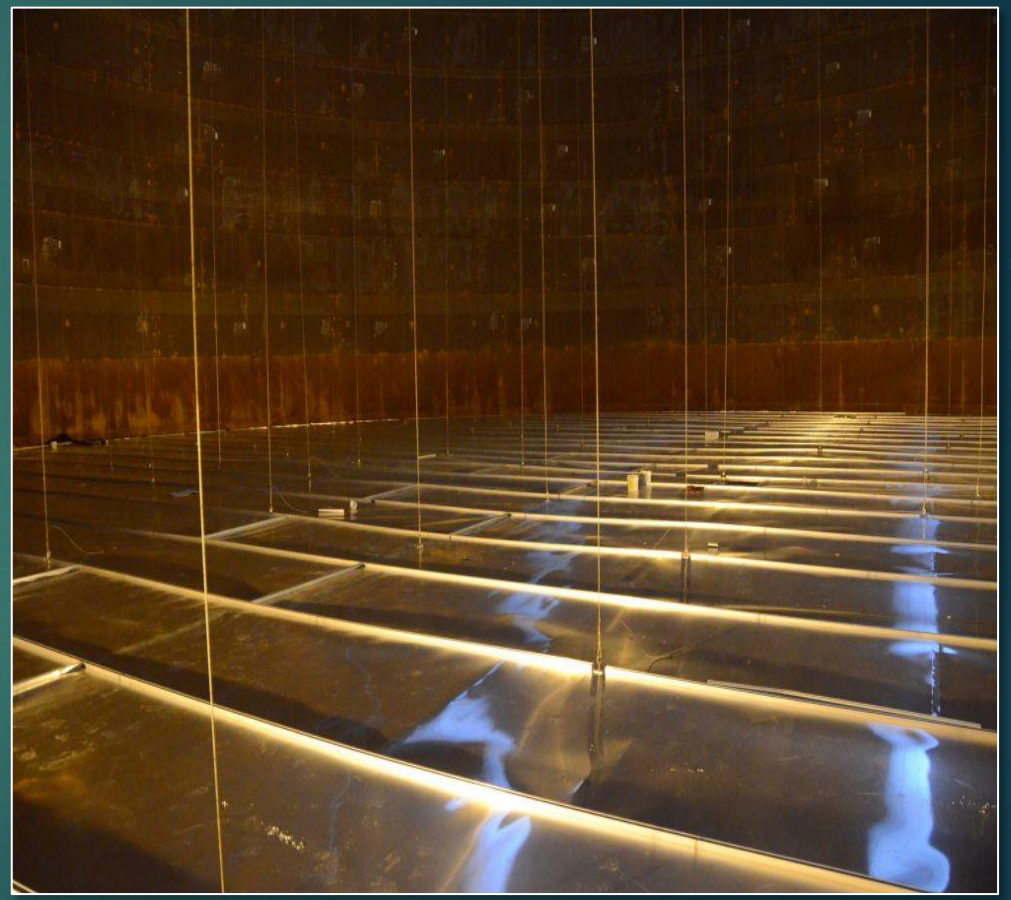
Doming External Floating Roof Tanks

- Doming floating roof tanks reduces wind effect on fugitive emissions
  - Installation of domes estimated to reduce ~50% of emissions from standing losses
- Doming tanks is expensive and requires the tank to be non-operational for extended periods
  - Installing domes can take up to 12 weeks depending on tank size
  - External floating roof tanks can be as large as 299 feet in diameter



Cable Suspended Roofs

- Cable suspended floating roofs are designed with cable suspension systems to support the floating roof and remove the need for roof legs
- Emissions are reduced by eliminating floating roof leg penetrations that provide a potential opening where VOC can be released
- Retrofitting is not also possible depending on the construction of the tank
  - Not all fixed roofs are designed to support the weight of a cable suspended floating roof
- Installing a new cable suspended roof is expensive
  - Estimates are upwards of $200,000



Secondary Seals

- Primary and secondary seals are used on floating roof tanks to seal the annular space between the floating roof and the tank shell to prevent VOC vapors from migrating out of the tank
- Rule 463 does not require both a primary seal and secondary seal on all floating roof tanks

Vapor Recovery Systems

- Fixed roof tanks currently required to vent to a fuel gas system or an emissions control system

Emission Control Systems

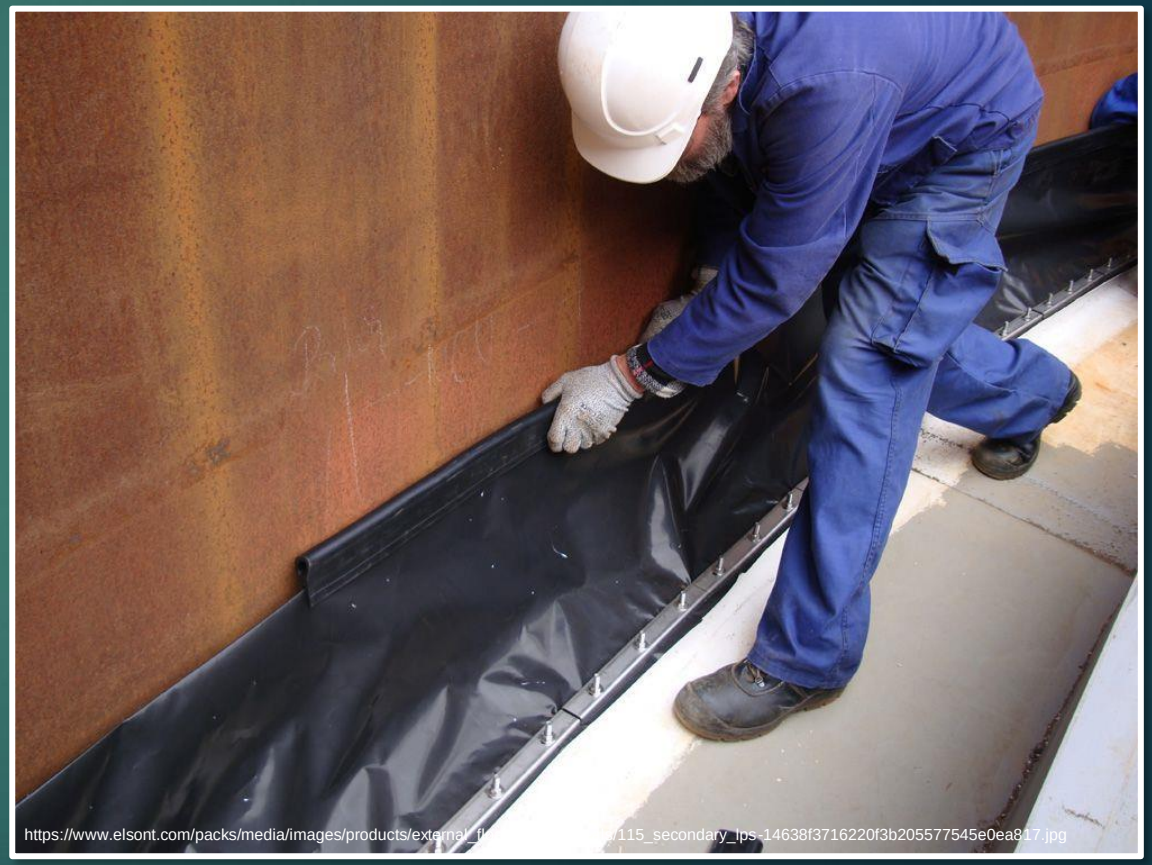
- Combustion
  - Collected vapors combusted to prevent VOC to atmosphere – required to have 95% control efficiency
- Non-combustion
  - Collected vapors processed through carbon adsorption to prevent VOC to atmosphere – required to have 95% control efficiency

Fuel Gas Systems

- Fuel gas systems collect vapors and pipe them to be used as a source of fuel to power onsite combustion equipment
  - No percent efficiency associated with these systems as all the vapors are collected to be used as fuel

Floating Roof Tank Seal Gaps

- Gaps between the floating roof seals and the tank shell are allowed by Rule 463 and other agency tank rules
- More stringent gap requirements reduce emissions by decreasing the available space for vapors to leak



Cost-Effectiveness for Leak Detection and Pollution Control Technology

Overview of Cost-Effectiveness Analysis for the BARCT Assessment

Cost-effectiveness is the net cost (capital costs plus annual operating costs) divided by emission reductions (tons)

South Coast AQMD used the 2022 Air Quality Management Plan (AQMP) cost-effectiveness threshold of $36,000 per ton of VOC reduced (adjusted annually for inflation) as guidance for establishing the proposed BARCT emission limit

Incremental cost-effectiveness analysis is conducted when there is more than one control option which would achieve the emission reduction objective

All BARCT assessments will only evaluate storage tanks not already regulated under Rule 1178 (approximately 1,010 storage tanks regulated only by Rule 463)

Staff determined that of the 1,010 tanks approximately 67% store product with vapor pressures high enough to trigger control requirements (679 tanks)

Cost-Effectiveness Calculation

- **Cost-Effectiveness =**

$$\frac{(Annualized\ Capital\ Cost + Annual\ O\&M)}{Estimated\ Annual\ Emissions\ Reductions}$$

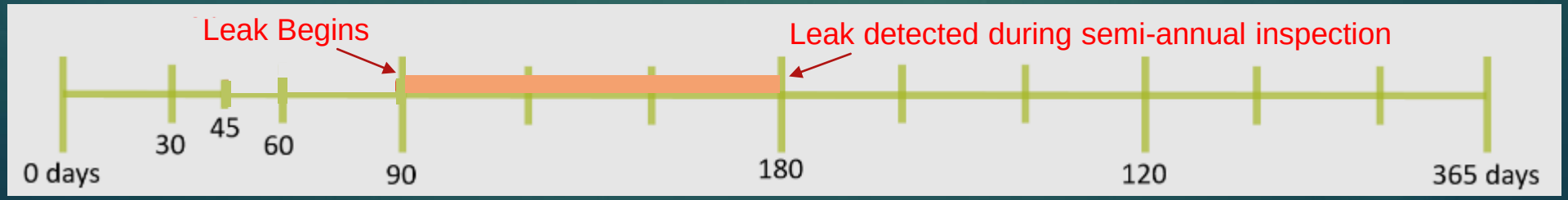
- Annual O&M calculated using the discounted cash flow method with an interest rate of 4%
- Cost estimates were taken from the 2023 Rule 1178 staff report and the PAR 1148.1 amendment process
- Cost estimates can be refined if more accurate information is received from vendors and facilities

Estimating Emissions from Leaks

- U.S. EPA's 2016 Control Technologies Guidelines for the Oil and Gas Industry estimates for uncontrolled emissions from tanks (Table 4-2)
  - Provides emission estimates in tons of VOC per barrel of oil per day
  - Calculated uncontrolled emissions rate is 0.26 tpd for average fixed roof tank storing crude oil
- Staff evaluated cost-effectiveness for the 679 storage tanks that require controls under Rule 463
- Staff reviewed inspection reports from a statistically significant sample of tanks and found that 1% of tanks will experience a major leak in a year (> 78,600 ppm)

Leak Assumptions

- Staff assumes there will be 6.8 major leaks in a year (1% of 679)
- Leak occurs for ½ the time between quarterly inspections (90 days)
- Under these assumptions VOC leaks from storage tanks estimated at 159 tons/yr




https://uaenews4u.files.wordpress.com/2022/10/flir-gfx320-ogi-camera.jpg

OGI Cost-Effectiveness Assumptions

- Staff assumed one camera per company
  - Estimated that 91 companies account for the 679 Rule 463 tanks that require tank controls
- Cameras cost approximately $120,000
- Expecting a ten-year life span for cameras
- Operating and maintenance cost are estimated to be $1,500 per year
- Operator labor cost estimated to be $400 per day of inspection

Cost-Effectiveness of OGI Inspection Frequencies

Cost-Effectiveness	Every two months	Monthly	Every two weeks	Weekly	Every other day	Daily
Total cost over 10 years ($)	$29,184,008	$31,368,008	$35,736,008	$45,928,008	$93,248,008	$159,860,008
Total emission reductions (tons over 10 years)	1,061	1,326	1,467	1,529	1,574	1,591
Cost effectiveness ($/ton VOC)	**$27,511**	**$23,656**	**$24,352**	**$30,032**	**$59,261**	**$100,465**
Incremental cost ($/ton VOC)	N/A	**$8,235**	**$30,882**	**$164,706**	**$1,070,588**	**$3,767,647**

- Daily and every other day OGI monitoring are above the cost-effectiveness threshold
- Weekly tank OGI monitoring is cost-effective but incremental cost-effectiveness must also be considered

Staff is proposing to include OGI tank scans every two weeks for tanks:

- ≥ 39,630-gallon capacity storing product with a TVP ≥ 0.5 psia
- ≥ 19,815-gallon capacity storing product with a TVP ≥ 1.5 psia

Open Path Cost-Effectiveness

- Cost assumptions for open path technologies include:
  - Cost per device at $190,000
  - Estimated installation cost as to equal equipment cost at $190,000
    - Installation cost was not received
  - O&M cost per unit at $5,000 per year
  - Required number of devices: 345
  - Equipment life of 20 years

Total cost over 20 years ($)	$153,992,705
Total emission reductions over 20 years (tons)	3,180
Cost-effectiveness ($/ton VOC reduced)	$48,425

Staff Recommendation

Open path monitoring is not cost-effective and therefore staff will not be requiring the use of open path as a monitoring tool

Stationary Gas Sensor Cost-Effectiveness

- Staff estimates an annual cost of $10,000 per sensor as a service
- Assumed that each tank will require one sensor
- Analysis assumes the sensors capture 100% of estimated emission reductions

Emission Reductions (tons/year)	159
Number of sensors (assumption 1 sensor per tank)	679
Cost per year	$6,790,000
Cost-effectiveness ($/ton VOC reduced)	$42,704

Staff Recommendation

Fixed sensors are not cost-effective; therefore, staff will not require the use of stationary gas sensors as a monitoring tool

Proximity Switch Cost Assumptions

- Cost-effectiveness analysis only considers the use of proximity switches at oil and gas production facilities (247 facilities)
  - Oil and gas production facilities are typically more compact allowing for one transmitter to support multiple switches if needed
- Costs were obtained from the 2023 Rule 1178 staff report and adjusted to 2024 dollars
  - $8,200 per tank (switch, transmitter, power source, radio, and cellular connection)
  - Installation assumed to be half of the equipment costs ($4,100)
- Staff is assuming:
  - One switch per tank
  - One tank per facility (247 tanks)
  - 1% of tanks will experience a leak in a year
  - 10 year equipment life
- Emission reductions calculated using a leak rate of 0.26 tons/day and a leak duration of 7 days (OGI inspections every two weeks would give a possible duration of 7 days assuming a leak occurs halfway between inspections)

Proximity Switch Cost-Effectiveness

Cost per facility ($)	$12,300
Total cost for all 247 facilities ($)	$3,038,100
Emission reductions per year (tons)	4.5
Emission reductions over 10 years (tons)	45
Cost-effectiveness ($/ton VOC reduced)	$67,582

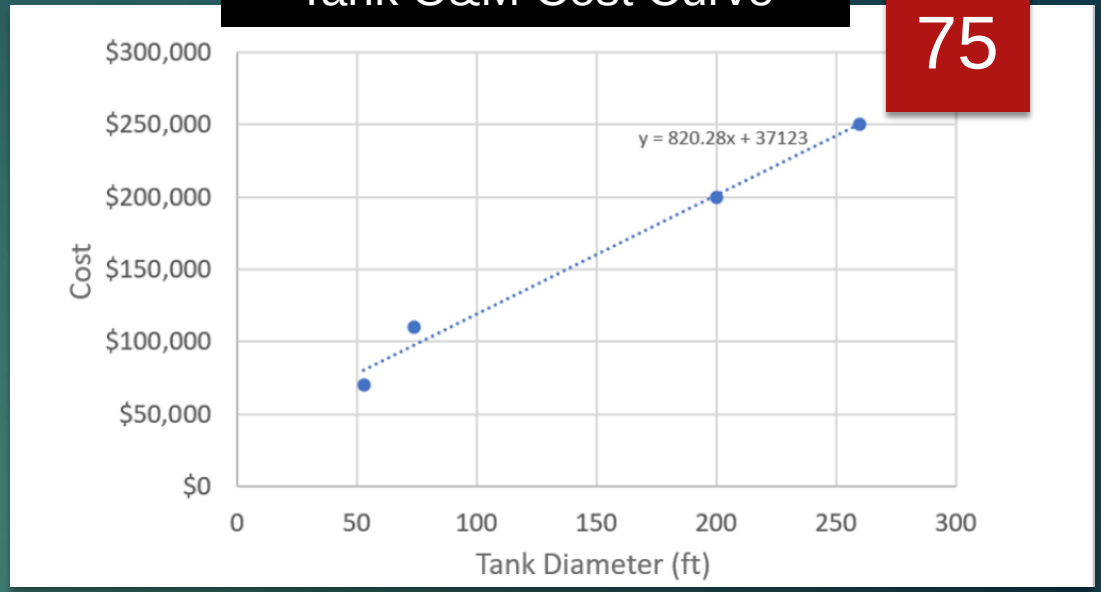
Staff Recommendation

Proximity switches are not cost-effective; therefore, staff will not require the use of proximity switches as a monitoring tool

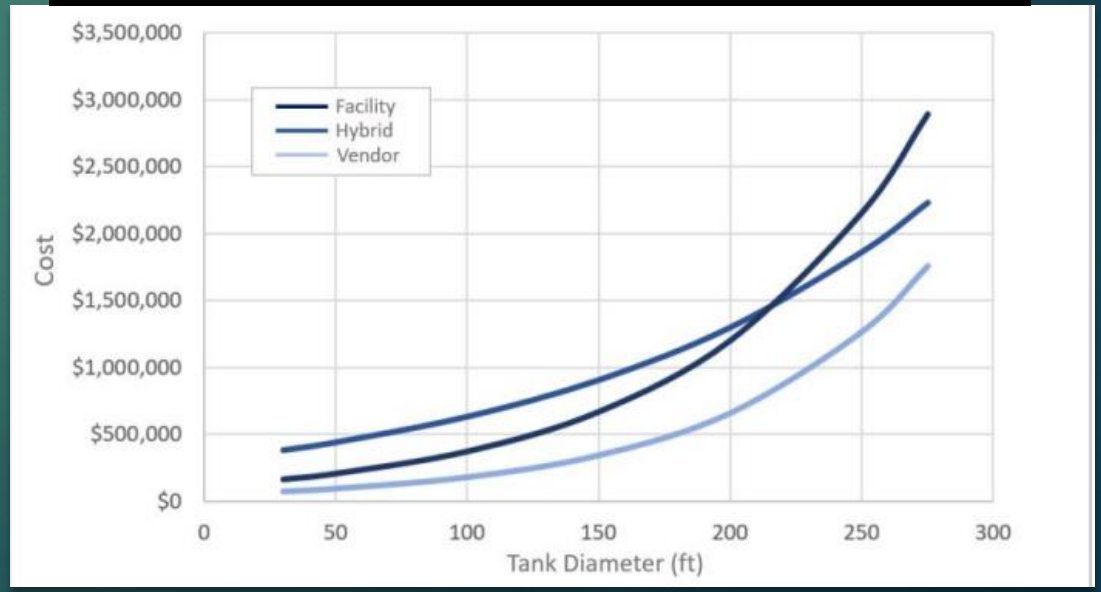
External Floating Roof Tank Doming Cost Equations

- Costs were obtained from facilities, dome suppliers, and dome maintenance service providers during the 2023 Rule 1178 amendment process
  - Quotes spanned from years 2003 to 2022 for tanks of various diameters (30 - 160 ft)
- Facility data (linear cost curve) does not reflect the exponential increase in doming costs shown in vendor data (exponential cost curve) nor data beyond 160 ft diameter tanks
- Staff created a hybrid cost curve based on:
  - Linear cost curve data points (as shown in facility cost curve)
  - Exponential cost curve character for larger diameter tanks (as shown in vendor cost curve)

Tank O&M Cost Curve



Tank Equipment and Installation Cost Curve



External Floating Roof Tank Doming Cost Assumptions

Staff is assuming a dome equipment life of 50 years

Staff added an average fire suppression system cost of $105,500 per tank based on two fire suppression vendor quotes and two facility quotes

Staff is assuming permitting fees based on Rule 301 schedule C fees and Title V Amendment fees in the total costs

- $7,002 permit fee from schedule C fee rate
- $1,857 Title V amendment fee

Staff is considering the additional cost of cleaning and degassing if dome installation does not occur alongside a required API 653 inspection (API 653 inspection frequency can vary but typically they are required every 20 years)

External Floating Roof (EFR) Doming Costs

- Staff utilized the TankESP program to calculate emissions for various tank configurations based on operating year 2019 throughput data
  - 2019 throughput data was more complete for the sample group of tanks
- For the analysis, staff only considered tanks that would be required to dome under current Rule 1178 doming requirements
  - Installation of domes for EFR tanks storing product with a TVP of 3.0 psia or higher
- Staff analyzed 36 EFR tanks with known throughputs (approximately 40% of EFR tanks regulated by only Rule 463)*
  - 20 EFR tanks were either below the 3.0 psia TVP threshold or were out of service
  - 16 EFR tanks were at or above the 3.0 psia TVP threshold (of which 8 EFR tanks were already domed)
- The remaining 8 EFR tanks were analyzed to determine doming cost-effectiveness

*Staff is aware that there may be EFR tanks that were not captured in this analysis, costs can be adjusted if data on more tanks becomes available

External Floating Roof Doming Cost-Effectiveness

Cost-Effectiveness	Doming Without Cleaning & Degassing	Doming With Cleaning & Degassing
Equip + Install	**$2,345,032**	$2,345,032
Permitting	**$62,013**	$62,013
Fire Suppression	**$735,000**	$735,000
Cleaning & Degassing	**0**	$2,583,523
O&M ($)	**$315,012**	$315,012
CE ($/ton VOC reduced)	**$32,487**	$56,765

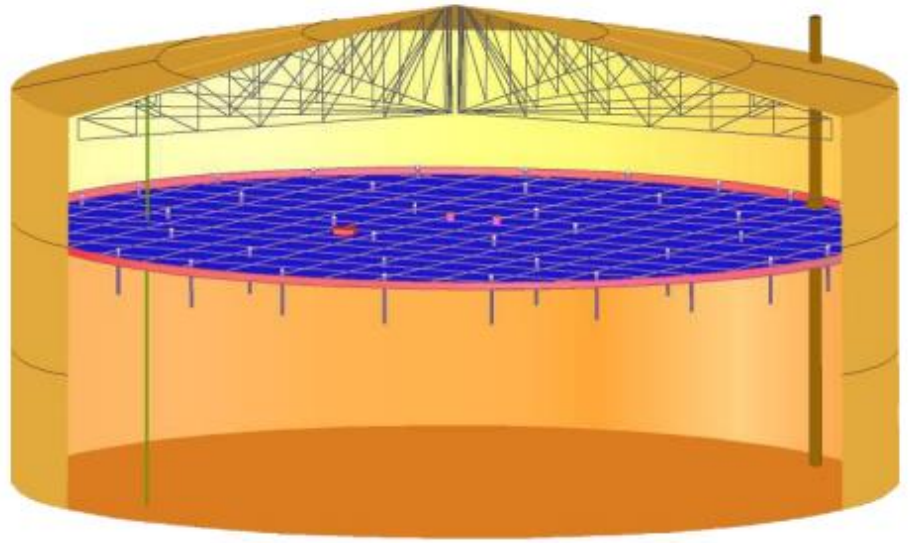
Staff Recommendation

Doming required for all EFR tanks storing product with a TVP of 3.0 psia or more at the time of the next API 653 inspection or within 20 years of adoption date

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Cable Suspended Roofs Cost Assumptions

- Cable suspended roofs can be retrofitted to some tanks depending on existing floating roof and fixed roof material and structure
- Estimated to result in ~8% average reduction in standing losses*
- Equipment life estimated at 20 years
- Total costs range from $120,000 – $670,000 depending on tank size
- Staff used TankESP to calculate emission reductions for an average internal floating roof (IFR) tank storing a high RVP product with the following parameters:
  - Diameter: 87 ft
  - Storing gasoline with an RVP of 10 psia
  - Annual throughput of 115,610,089 gallons



Floating roof with leg penetrations

* Based on TankESP PRO software calculation for eliminating roof legs on internal floating roof tank 70', 90' and 117' in diameter and 40' to 50' high, storing gasoline with RVP 6 and RVP 10, crude RVP 6 and RVP 10, jet kerosene at 80 °F, located in Los Angeles county, with standard deck fittings and

Cable Suspended Roof Retrofit Cost-Effectiveness

Cost-Effectiveness	Support legs	Cable Suspended Roof
Baseline emissions (lbs/yr)	3,370.51	3,174.44
Emission reductions (lbs/yr)	N/A	196.07
Emission reductions (tons/yr)	N/A	0.098
Emission reductions over 20 years (tons)	N/A	1.96
Cost over 20 years ($)	N/A	$255,401
CE ($/ton VOC reduced)	N/A	**$130,307**

Retrofitting IFR tanks with cable suspended roofs is not cost-effective, therefore staff is not considering requiring the use of cable suspended roofs

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Secondary Seals Cost Assumptions

Updated Slide

- Staff analyzed a statistically significant sample of IFR tanks without secondary seals regulated only by Rule 463 to determine cost-effectiveness
  - Approximately 70% already had secondary seals
- Costs were obtained from 2001 Rule 1178 adoption – adjusted to 2024 dollars
  - Installation and equipment costs: $220/ft
  - Rubber replacement: $42/ft
  - Permitting fees: $9,000/tank
- Reductions based on Tank ESP calculations for adding secondary seals to IFR tanks storing various liquids including gasoline and crude RVP 5

Cost-Effectiveness and Incremental Cost-Effectiveness Analyses

Updated Slide

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Secondary Seals Cost-Effectiveness

Cost-Effectiveness	Single Seal	Secondary Seals
Baseline emissions (lbs/yr)	21,463	15,286
Emission reductions (lbs/yr)	N/A	6,177
Emission reductions (tons/yr)	N/A	3.10
Emission reductions over 20 years (tons)	N/A	61.77
Total Costs ($)	N/A	$412,000
CE($/ton VOC reduced)	N/A	**$6,700**

- Cost-effectiveness of installing secondary seals on IFR tanks is below the VOC cost-effectiveness threshold of $36,000 per ton VOC reduced

Staff Recommendation

Require the installation of secondary seals on IFR tanks the next time the tank is emptied or degassed but no later than 10 years after date of adoption

Vapor Recovery Systems Cost-Effectiveness

Performance Tests

- Annual performance testing shows greater than 99% efficiency for combustion vapor recovery unit
  - Other records of performance testing show compliance – efficiency not specified
  - Initial performance testing shows greater than 99% efficiency
- Staff identified a non-combustion unit that achieved over 99% efficiency on the most recent performance test

Cost Effectiveness

- Not evaluated – units already meeting 98% emission control efficiency

Staff Recommendation

Require overall control efficiency of at least 98% by weight for vapor recovery emission control systems

Current Seal Gap Compliance

- Staff examined a random sample of the most recent inspection reports for 20% of approximately 200 floating roof tanks subject to gap inspections
- All tanks currently in compliance with existing seal gap requirements
- 10% of tanks would not meet the more stringent SJVAPCD requirements
- Cost-effectiveness was analyzed to bring the remaining 10% of tanks up to the proposed seal gap standard
- TankESP was used to estimate the emission reductions achieved from an average tank fitted with more stringent seal gap requirements

https://trinityprod.trinityconsultants.com/images/default-source/siteassets/software/software/tanks/tankesp_l3desktop.jpg?sfvrsn=d63ea732_2

Seal Gap Requirements Cost-Effectiveness

- Analysis run on a tank storing crude oil with an RVP of 6 psia and a diameter of 117 ft to estimate cost-effectiveness
  - Assuming seals need to be replaced
  - Assuming 20-year equipment life
  - Assuming equipment and installation costs of $220 per foot

Total emission reductions over 20 years (tons)	0.029707
Total cost to update seal ($)	$25,740
Cost-effectiveness ($/ton VOC reduced)	$866,451

Requiring all tanks meet the more stringent gap requirements is not cost-effective and therefore staff will not be updating seal gap requirements to match SJVAPCD and South Coast AQMD Rule 1178

Summary of Proposed Requirements

- Staff is proposing the following requirements as BARCT:
  - OGI inspections every two weeks for the following organic liquid storage tanks:
    - Storage tanks with a capacity ≥ 39,630 gallons storing product with a TVP ≥ 0.5 psia
    - Storage tanks with a capacity ≥ 19,815 gallons storing product with a TVP ≥ 1.5 psia
  - Doming EFR tanks with a TVP ≥ 3 psia
  - Secondary seals on IFR tanks
  - Require overall control efficiency of at least 98% by weight for vapor recovery emission control systems
- Additionally, PAR 463 will:
  - Clarify that storage tanks must remain in vapor tight condition (<500 ppm) at all times
  - Incorporate the federal seal gap requirements by reference
  - Incorporate contingency measures requiring OGI inspections at increased frequencies

Next Steps

Rule Schedule

Release Preliminary Rule Language and Staff Report	March 22, 2024
Public Workshop	March 27, 2024
Stationary Source Committee	April 19, 2024
Set Hearing	May 3, 2024
Public Hearing	June 7, 2024

Notifications and Rulemaking Documents

- For PAR 463 rulemaking documents, visit:

  Proposed Amended Rule 463 Page

- To receive e-mail notifications for PAR 463 sign up at: www.aqmd.gov/sign-up

https://aventislearning.com/wp-content/uploads/2020/03/Collaboration-1.jpeg

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